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WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

ASTRONOMY.

Astrophysical observations of Jupiter.—Ricco publishes a fine series of eighteen drawings of the planet, made, with one exception, in 1881, 1882, and 1883, by means of the ten-inch telescope of the observatory of Palermo. He gives, also, a large number of micrometrical measures, and detailed descriptions of the appearance of the planet and its surface-markings, on forty-seven different dates. The effect of the 'red spot' upon the contour of the adjacent belts is well brought out. — (*Mem. soc. spett. ital.*, May, 1883.) C. A. Y. [172]

Photometric observations of eclipses of Jupiter's satellites.—Cornu and Obrecht give the results of some experiments upon artificial eclipses made to imitate the eclipses of Jupiter's satellites, using the method already referred to in these columns. They find that the probable error in determining the time when the light of the satellite is reduced to one-half its normal amount is about a hundredth of the total time of obscuration. They propose, also, the use of a polariscopic arrangement in place of the 'cat's-eye,' and, in this connection, append the following note: "We have recently learned that the astronomers of Harvard college employ an analogous arrangement — of which, however, the description is not known to us — for the purpose of determining the moment of disappearance (*pour arriver à définir l'époque de l'éclat nul*). If the apparatus is analogous, the method of observation is, as one sees, entirely different." They have evidently been misinformed; for the very essence of Prof. Pickering's plan consists in the determination, not of the moment of disappearance, but of half-brightness. — (*Comptes rendus*, June 25, 1883.) C. A. Y. [173]

MATHEMATICS.

Surfaces of constant curvature.—M. Weingarten here deals with certain properties of the linear elements on surfaces with a constant measure of curvature. Certain considerations connected with the modern theory of functions, particularly that portion of the theory which deals with linear differential equations of the second order, have led him to conjecture that the determination of the geodetic lines upon a surface of constant curvature, by means of certain given linear elements, stands in a close relation to the theory of the linear differential equations of the second order. M. Weingarten makes the remark (which, though not new, is important here) that the extension of those properties of curved surfaces, studied and enunciated by Gauss, which depend upon a given form of the linear element, is much simplified by the introduction of certain functions of the position of a point upon the surface. The values of these functions are given in terms of the coefficients of the linear element in such a way, that, by the introduction of new (two) variables, we arrive again at the original linear element. The functions possessing this (invariantive) property are called

flexion-invariants (*biegungsvarianten*). As an example of flexion-invariants, we have the 'measure of curvature' of a surface. From the differential coefficients of a flexion-invariant, and the Gaussian coefficients, E, F, G , of a linear element of a surface, an indefinite number of new invariants can be formed, two only of which are independent. The author gives a brief account of Beltrami's work on these functions, and then considers particularly the surfaces of constant curvature. The paper is an exceedingly interesting one to the student of this particular branch of geometry, and is a valuable addition to the previous memoirs, by M. Weingarten, on this and cognate subjects. — (*Journ. reine ang. math.*, 1883.) T. C. [174]

PHYSICS.

Density of the earth — Major R. v. Sterneck of the government Military-geographical institute of Vienna, last year, tried Airy's method of the determination of the earth's mean density in the St. Adalbert shaft of the silver-mines at Příbram, Bohemia, at depths of 516 and 972.5 metres. His average result was 5.65, which agrees closely with the values determined by other methods. On comparing his measures with Airy's, a curious agreement appears in the number of seconds gained by a clock at different depths, and a continual decrease in the deduced mean density as the depth increases. Airy found (1854), at a depth of 383 metres, that his clock gained 28.25 a day, and the density was 6.57; v. Sterneck's figures are 516, 28.4, and 6.28, and 972, 28.3, 5.01, respectively: whence he concludes, "that, in the interior of the earth, the resultant of gravity, centrifugal force, and the attraction of the superincumbent mass, is constant." — (*Mitth. k.-k. milit.-geogr. inst. Wien*, 1882, ii. 77.) W. M. D. [175]

Electricity.

Geographical variation of horizontal intensity.—F. Kohlrausch proposes to use a form of his local-variometer (described in *Ann. phys. chem.*, xviii. 545) in which the scale is at a distance A from the axis of suspension, and attached to the instrument, and obtains between the horizontal intensities at two different places the relation —

$$\frac{H' - H}{H} = \frac{\tan \phi}{4A} (n' - n) + \mu(t - t');$$

ϕ being the angle through which the frame of the instrument is turned, n and n' the deflections in scale-divisions, and μ a coefficient of the temperature, t . — (*Ann. phys. chem.*, xix. 130.) J. T. [176]

Thermochemical properties of electromotive force.—Edlund investigates the thermal changes at the electrodes of a voltameter by placing the junctions of a thermopile in front of the electrodes, and enclosing both in a porous membrane. He finds, that, when the electrodes are copper and the liquid copper sulphate, the electromotive force between the metal and the liquid uses less heat for formation of current than is set free in the formation of copper sulphate.

The same law holds for zinc and zinc sulphate, cadmium with its acetate, and lead with its acetate; but for silver, with its sulphate, nitrate, and acetate, the law is reversed. In a Daniell cell, *a fortiori*, less heat is used for formation of current than is set free in the chemical action of the cell. — (*Ann. phys. chem.*, xix. 287.) J. T. [177]

CHEMISTRY.

(General, physical, and inorganic.)

Speed of dissociation of brass.—Mr. E. Twitchell (under Prof. Robert B. Warder's direction) made the following determinations, which were suggested by Bobierre's method for the separation of copper and zinc in alloys. A piece of brass wire (no. 17) 150 mm. long and 1.43 mm. in diameter was heated to redness in a stream of hydrogen in a porcelain tube. The loss in weight, from hour to hour, is given in the following table:—

Time in hours.	Weight of alloy.	Loss per hour.	Zinc present.	A.
0	2.0570		.7409	
1	1.9128	.1442	.5967	92
2	1.8527	.0601	.5366	70
3	1.7855	.0672	.4694	66
4	1.7418	.0437	.4257	60
5	1.7168	.0250	.4007	53
6	1.6957	.0211	.3796	48
9	1.6624	.0111	.3463	37
12	1.6339	.0095	.3178	31

The figures given under A are proportional to the 'coefficient of speed,' as calculated from each observation, on the hypothesis that the zinc expelled at each moment is proportional to the whole quantity of zinc present. The steady decrease in the last column shows that this hypothesis does not obtain under the conditions of the experiment, but that an appreciable interval of time is required for the transfer of zinc from the central portion to the surface of the wire. Further experiments upon this *diffusion* of zinc are in progress. — (*Sect. chem. phys. Ohio mech. inst.; meeting May 31.*) [178]

AGRICULTURE.

Influence of temperature and rainfall on the wheat-crop.—A comparison of the average temperature and the rainfall in England during the months of July and August for the last thirty-six years, with the corresponding wheat-crop, justifies the following conclusions: provided the stand of the crop at the beginning of July is promising, a temperature above the average for the succeeding two months insures more than an average crop as regards quantity, unless extraordinary circumstances, such as violent storms, intervene. Rainy weather may reduce the quality of the crop. On the other hand, however promising the crop may be at the end of June, a temperature below the average in July and August involves a small crop. If the weather is clear, the quality may be good, while, if cold and rain are united, the poorest crops are the result; such as those of 1879, when the temperature was 2.8° F. below the

average, and the rainfall four inches above the average, or that of 1816 (the poorest crop on record), when the temperature was 4.8° F. below the average. — (*Bied. centr.-blatt.*, xii. 291.) H. P. A. [179]

Effect of phosphatic manures in drought.—In the course of some field-experiments made during the very dry season of 1881, Emmerling observed that in one case manuring with ammonia alone produced a greater gain than manuring with ammonia and superphosphate. The result may have been accidental, as no duplicate trials seem to have been made; but Emmerling thinks that the manuring with phosphoric acid hastened the ripening of the plants, while the ammonia had the opposite effect of postponing the ripening, and keeping the plants green longer. (This effect of phosphoric acid has been observed in water-culture experiments, and silica also seems to exert a similar action.) — (*Bied. centr.-blatt.*, xii. 297.) H. P. A. [180]

Damage to grain by wetting.—Märcker has examined a sample of barley which had been exposed to rain for fourteen days after it was cut. A considerable proportion of the starch had been converted into sugar. A loss of about six per cent of starch took place. The albuminoids were also altered, both the insoluble and soluble proteins having been partially converted into amides. The proportion of seed capable of germination was reduced from ninety-eight per cent to forty-five per cent. Kobus obtained similar results in an examination of damaged wheat. — (*Bied. centr.-blatt.*, xii. 326.) H. P. A. [181]

MINERALOGY.

Enclosures in muscovite.—The occurrence of biotite and muscovite in one crystal is well known, and has been investigated by H. Carvill Lewis. He prepared cleavage-sections from one specimen, and arranged them in the order in which they occurred. The biotite contrasts strongly with the light-colored muscovite, and has often well-defined edges. The two micas are arranged symmetrically in relation to their prismatic planes, as may be shown by the crystal edges when they are well developed, or by the strike-figures which are parallel in the two micas in the same folia, making it probable that they have crystallized together out of the same solution. In examining a series of sections from one specimen, it is found that the proportion of the two micas varies in different parts of the crystal; the biotite, the more unstable of the two species, gradually giving way, and being changed into the more hardy muscovite.

Of a different nature are the superficial markings of magnetite, which occur from various localities. These markings form a series of branching lines, which run in three directions across the plates of the mica, crossing each other at angles of 60°, and have been regarded as repeated twinning around a dodecahedral axis. These lines, however, as shown by the author, bear a fixed relation to the axes of the mica, and are not due to any inherent property of the magnetite. If a crystal showing these markings be dissected, the lines of marking will all be found to lie in parallel direction; nor is there any direct connection

with the markings on adjacent plates: one may be covered by the markings, the next free from them. The magnetite does not penetrate, but lies superficially upon the mica plates, and the lines follow the direction of the rays of the strike-figure. The author regards the magnetite as not derived from any external source, but from the muscovite itself, occurring, not along cracks or near the exterior of the crystals, but grouped in the interior of the same. — (*Proc. acad. nat. sc. Philad.*, Dec., 1882.) S. L. P. [182]

GEOGRAPHY.

(Europe.)

Deformation of the earth's surface. — J. Girard calls attention to some interesting observations on apparent changes of level of neighboring points. One account attested by Girardet (*Exploration*, June, 1882) is of villages in the Jura which were hidden from each other at the beginning of the century, or even only forty years ago, but are now in sight. First the roofs, and later the walls, became visible by the slow warping of the ground. Another example is recorded in Bohemia, about thirty miles south of Karlsbad, where the people of Hohen Zedlisch are convinced that their village is rising; for thirty years ago they could see only the top of the church-spire in Ottenreuth, while now more than half of it is in view, and some roofs of lower buildings have also risen into sight. A line of levels has been run here to detect any further changes (*Congres sc. géogr.*, 1875). Girard does not attempt any criticism of these statements, but accepts them as proved. There would seem to be room for other explanations than the one suggested. — (*Rev. de géogr.*, 1883, 349.) W. M. D. [183]

Maps of Norway. — The Norwegian geographical survey (*Geografiske opmaaling*) has published maps as follows: a guide-map, showing the progress of triangulation from 1779 to 1876 (only a small part of this work remains unfinished), — based upon this are several topographic maps on various scales; for the southern part of the country some are even 1 : 50,000 (or 1 : 10,000), in many sheets; the general map of southern Norway (1 : 400,000), in eighteen sheets; district-maps (1 : 200,000); and rectangle-maps (1 : 100,000), in fifty-four sections, with contours and mountain shading, and the larger bodies of water in blue. This serves as a basis for the geological survey under Prof. Th. Kjerulf. A general geological map (1 : 1,000,000) is also published. The coast-survey publishes charts of the southern shores on 1 : 50,000; of the northern, on 1 : 100,000. Thirty-two of the former and thirteen of the latter are completed. Besides these, there are a general coast-map (1 : 200,000) in thirteen sheets, and another on a smaller scale in five sheets, and fishery-maps (1 : 100,000) in eleven sheets. — (*Mitth. geogr. ges. Wien*, xxvi. 1883, 190.) W. M. D. [184]

The Bavarian forest. — The physical features of this submountainous district, extending north of the Danube below Regensburg, are described under its topography and geology by Dr. C. W. von Gümbel, and its climatic relations by Dr. Ebermayer. The

article is hardly susceptible of concentration, and we reproduce only what is said concerning the glaciation of the higher ground contemporaneous with that of the Alps. It is admitted that the diluvial deposits do not point with distinctness to glacial action, that striations and moraine-walls can hardly be recognized, and that the characteristic morainic landscape, so pronounced near the adjacent Alps, is absent here; but the numerous small lakes in the higher parts of the country (Arber-, Rachel-, Bestritzer-, Gírgl-See and others), and the plentiful peat-swamps, the remains of extinct water-basins, are accepted as evidence of former glaciation. Among all the lakes, there is not one which cannot be explained as resulting either from local glacial erosion, or from obstruction of old valleys by drift-deposits. — (*Deutsche geogr. blätter*, vi. 1883, 21.) W. M. D. [185]

(Asia.)

Telegraph-line in China. — Since the destruction of the short railroad from Shanghai to Wusung by the Chinese shortly after its building in 1877, it has been thought that there would be opposition to further introduction of foreign contrivances; and two years ago, when the construction of a telegraph-line was begun between Shanghai and Tientsin, a party of soldiers was detailed to guard the foreign engineers employed on it. The caution proved unnecessary; and the chief difficulties encountered were the numerous canals, some of which had to be crossed by cables. The want of good roads was a serious embarrassment when the line ran at a distance from the grand canal. The line is 938 miles in length, and required nearly twenty thousand poles. The construction was begun in June, 1881, at the two termini, and in December was opened to public use. — (*Pet. geogr. mitth.*, 1883, 231.) W. M. D. [186]

Explorations in Cambodia. — Dr. Néis announces his arrival in Laos, on the border of Siam. From Sambok to Sombor the Mekong River is a continuous series of rapids, passable only for the native canoes. Thence above to Laos the left bank is encumbered with shoals. The country is chiefly covered with forests, which, along the river, are infested by Chinese pirates, who render river-traffic between Laos and Cambodia very limited. Laos contains some two hundred houses, and two thousand inhabitants, — Laotians and Chinese, who raise cotton and rice. The commerce is small, iron money is in use, and the Chinese are the chief traders. The ruins described by Garnier, to examine which was the chief object of the expedition, were visited. No inscriptions were found, and but a few interesting carvings. A sort of oven was filled with thousands of pieces of bark stamped, like medals, with three figures of Buddha: some retained traces of color and gilding. Some statuettes of Buddha of *faience* were found in a vessel embedded in the cement of the oven. Dr. Néis found the fauna of Laos essentially the same as that of Cambodia. He intended, at the date of writing, to penetrate as far as Bassak, in Siam, where he would endeavor to obtain as complete collections as possible. — (*Comptes rendus soc. géogr.*, no. 11.) W. H. D. [187]

BOTANY.

Influence of diminished atmospheric pressure on the growth of plants.—Experiments conducted by Wieler at Tübingen show, that, all other external conditions being the same, plants will grow more rapidly under *diminished* atmospheric pressure. Thus, if a specimen of the common Windsor bean (*Vicia faba*) be grown in a receptacle in which the pressure of the air can be controlled, it will be found to grow faster until the pressure has been diminished to 100–300 mm.; the normal pressure under which the ancestors of the plant have flourished being, of course, not far from 760 mm. If, however, the pressure is reduced below the smaller figure given above, the rate of growth diminishes. Wieler found that the curve of growth of the sunflower is about the same as that of the bean. It was further shown by his experiments, that growth is retarded by increased pressure until the minimum is reached at 2–2½ atmospheres, from which point there is again an increase. Although the short abstract of these interesting results so far published is meagre in the extreme, it indicates that the field entered upon by Wieler (and by Bert in France) may compel us to revise some notions now held in regard to the adaptation of plants to their surroundings in past ages, and at the present time upon high mountains. — (*Botan. zeit.*, July 6.) G. L. G. [188

Pollination of Cypella.—Two Brazilian species of this genus of Irideae have been studied from time to time by Fritz Müller, who finds a number of interesting peculiarities in their flowering. The flowers, like those of *Cordia*, etc., are produced in abundance only on certain days, which recur more or less regularly, and apparently independently of climatic conditions. Nectar is secreted in pockets on the three petals, which are flexible, so that when a *Xylocopa* or *Bombus*, to which the flowers seem well adapted, alights on one in quest of nectar, it bends over with the weight of the bee, whose back is brought in contact with a stigma and the underlying anther. Commonly the bee goes immediately to another flower without trying the other petals of the one on which it has first settled, so that crossing is effected by it. One of the species studied proves to have self-impotent pollen: the other is fertile with its own pollen. The stingless bees (*Trigona*), though not necessarily excluded by structural peculiarities from the nectar, do not obtain it readily; yet their visits for the protectively colored (pale-bluish) pollen are sufficiently numerous to prevent the larger bees from visiting the flowers in numbers. — (*Berichte deutsch. bot. gesellsch.*, April 3, 1883.) W. T. [189

ZOÖLOGY.

(General physiology and embryology.)

Influence of gravity on cell-division.—E. Pflüger, by placing fresh laid frogs' eggs in a watch-glass, and adding a little water with semen, and pouring it off in a few seconds, was able to impregnate the eggs without allowing the gelatinous envelopes time to swell. The eggs then adhered to the glass, and so could be brought into various positions. The first

division occurs in three hours, and always in a vertical plane, no matter how the axis of the egg lies. When the axis of the egg (from dark to white pole) lies horizontally, the plane of division is still always vertical, but may form any angle with the ovic axis. The influence of gravity is also shown in that the upper pole divides more rapidly than the lower. If the position of the egg is exactly reversed, this still holds true, and development progresses; so that repeatedly the medullary furrow, with its high bordering ridges (nervous system), was found upon the *white* side when this was uppermost. Out of seventeen eggs, twelve developed so that the median plane of the body of the embryo coincided with that of the first division of the yolk. (This fact of a relation between the lines of cleavage and the axes of body is not novel, as Pflüger seems to think: there are many observations on various animals which prove such a relation.) From these experiments it results that the topography of the organs is not determined by the arrangement of the substance around the axes of the egg, but that the axis around which the organs are grouped is determined by gravity. — (*Pflüger's arch. physiol.*, xxxi. 311.) C. S. M. [190

Mammals.

Germ-layers of rodents.—A. Fraser finds in the common gray rat and the house mouse the same arrangement of the layers as in the guinea-pig. The *decidua* appears to differ in the mode of its formation from that which ordinarily obtains; and the very early, rapid, and voluminous formation of its solid mass appears to have some close and constant relation to the peculiar inversion of the blastodermic layers which is found in these rodents. — (*Journ. roy. micr. soc. Lond.*, June, 1883, 345.) C. S. M. [191

Intestinal absorption of fat by lymph-cells.—Zawarykin has studied the small intestine during active digestion, making sections stained with permanganic acid and picrocarmine. The material was obtained from dogs, rabbits, and white rats. The lymph-cells are found between the epithelial cells covering the follicle and in the underlying adenoid tissue, and finally in the mouths of the chylous vessels. These cells alone contain any fat, being charged with globules of various sizes. Their multifarious irregular forms, and the inconstant shape of the nucleus, indicate that they were performing active amoeboid movements when fixed by the osmic acid. From these appearances Zawarykin concludes that the lymph-cells (leucocytes) resorb the fat: they enter the epithelium, seize the particles of fat by amoeboid movements, then descend between the cylinder-cells, through the sub-epithelial endothelium and adenoid tissue, into the roots of the chylous vessels. In Peyer's patches the cells are present in crowds, and the resorption of fat seems particularly active at those points. (The presence of lymph-cells between the epithelial cells of the intestines has been known for some time, but the significance of their occurrence has not been heretofore understood. Sewall advanced the view that the immigrant cells remain and become epithelial cells; but that appeared highly

improbable. The manner in which fat is absorbed has been much discussed of late years, but the explanation given by Prof. Zawarykin appears to us the first satisfactory one which has been offered.)—(*Pflüger's arch. physiol.*, xxxi. 231.) C. S. M. [192]

ANTHROPOLOGY.

Brain-weight of boys and girls.—In the final result of the comparison of the two sexes in the human race, anatomical researches will form an important factor. Many anatomists have recognized this fact, and have instituted comparisons between the sexes from various points of view. M. Gustave le Bon reviews the work of M. Manouvrier and that of M. Budin, both of whom aver that "sex has no influence on brain-weight. With them the influence of sex is nothing more than the influence of height; and if the females as a whole exceed the males in brain-weight, it is simply because the weight of the body in the females is much below that of the males." M. le Bon puts the theory of his adversaries to the test in a very ingenious manner by comparing the brains of males and females having about the same weight. By this investigation it is shown that in the great majority of cases the male children surpass the females of the same weight in their cranial circumference. At the same age, height, and weight of body, the female brain is notably smaller than that of the male. — (*Bull. soc. anthropol. Paris*, v. 524-531.) J. W. P. [193]

The Galibis.—The tribe of Galibis lives on the borders of the Sinamari, and not far from Cayenne, in French Guiana, and it consists of only a few families. A group of fifteen of them were sent to Paris in 1882; and several gentlemen, among them Mr. Manouvrier, have undertaken to study their physique, customs, language, etc. The Galibis were domiciled in their native fashion in the *jardin d'acclimatation*, and passed their time in their ordinary pursuits. The skin is reddish brown, but differs with individuals, owing partly to mixed blood: the true color is also disguised by the use of paint. The hair and eyes are jet black. The other physical characters, as well as their language and occupations, are given with the greatest minuteness. A single observation will show the extreme caution with which fine theories should be spun. M. Capitan studied carefully the processes of making pottery among the Galibis. Hamy took occasion to remark upon this as upon the greater rudeness of ornamentation in other respects, and concluded that the Galibis had much degenerated since they were first studied. But Mortillet recalled the discussion to a sober view by remarking that the specimens in our museums are choice objects, selected by travellers for their great beauty, while those made by the Galibis in the *jardin* were by rude workmen for daily use. They show us the cabin of the poor, while the voyagers had despoiled the homes of the rich. Theories of degeneration based upon Hamy's facts were therefore unsubstantial. — (*Bull. soc. anthropol. Paris*, v. 602.) J. W. P. [194]

African psychology.—Max Buchner, writing to

Ausland, speaks rather encouragingly of the Bantu negro character. "The negro in his native condition is not apparently of a lower grade of natural intelligence than the European of the common class. He probably excels the European in a kind of selfish cunning, while the restraints of moral scruples and of the finer feelings operate less strongly upon him. Yet he is not destitute of a sort of moral instinct, a kind of taboo conscience, that causes him to hesitate to do wrong. For this reason the negro is never an open thief." Mr. Jefferson used to say that his slaves were all honest, but they could beat the world finding things. The negro, says Buchner, is above every thing positivist, practical, materialist, and is inaccessible to intangible considerations. The question 'Has the negro a religion?' cannot be answered at once, either affirmatively or negatively. It must first be made clear what is to be understood by religion. He has a confused mixture of vague wants and superstitious impulses. A system of computing time can hardly be predicated of such a people; but they have a kind of superficial calendar of the months, which they make to help regulate their agricultural operations. The negro undoubtedly possesses all the capacities for education and civilization to at least as great an extent as our primitive ancestors. The fact that the psychical and intellectual, as well as the physical, differences between particular races of men are really insignificant, is destined to be made plainer, the more the subject is impartially studied; and the efforts of certain men, learned in distinctions of types, to set up fixed marks of separation between them, will not succeed. — (*Pop. sc. monthly*, July.) J. W. P. [195]

NOTES AND NEWS.

The unexampled recent increase in the membership of the American association for the advancement of science, from a little over one thousand just before the Boston meeting of 1880, to nearly two thousand now, implies a considerable increase in its funds, and should imply direct participation by the association in the endowment of research, which its means have not hitherto permitted. No other way is now open for the association to advance science so securely.

We desire, therefore, to call the attention of the executive board of the association to the direct advantage which would certainly result in following the example of the British association by making an annual grant to the Naples zoölogical station, whose claims and advantages have already been so well stated in our columns by Miss Nunn and Dr. Whitman. The board would find no lack of applicants for the table thus secured, the cost of which would be four hundred dollars annually.

—Mr. George M. West of Escanaba, Mich., sends us a photograph of a hoe-shaped implement which is stated to have been made of native copper by hammering. The blade has a thin edge, and is said to be nearly nine inches long, about three inches wide, and one-half inch thick at the back where it joins the